MASTER SLIDE DECK

Master's Thesis

Amy Rae Fox

2014-2015

GOALS

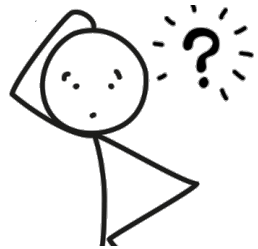
Author a **clever** piece of empirical research …

… in an *area* advantageous to my application for PhD study

… on a topic that I *will not hate* by the time I am done writing

… while contributing to the *reproducible research* community

Quantified Self



Self - Schemata

Markus, H. (1977). Self-Schemata and Processing Information About the Self. Journal of Personality and Social Psychology, 35(2), 63–78.

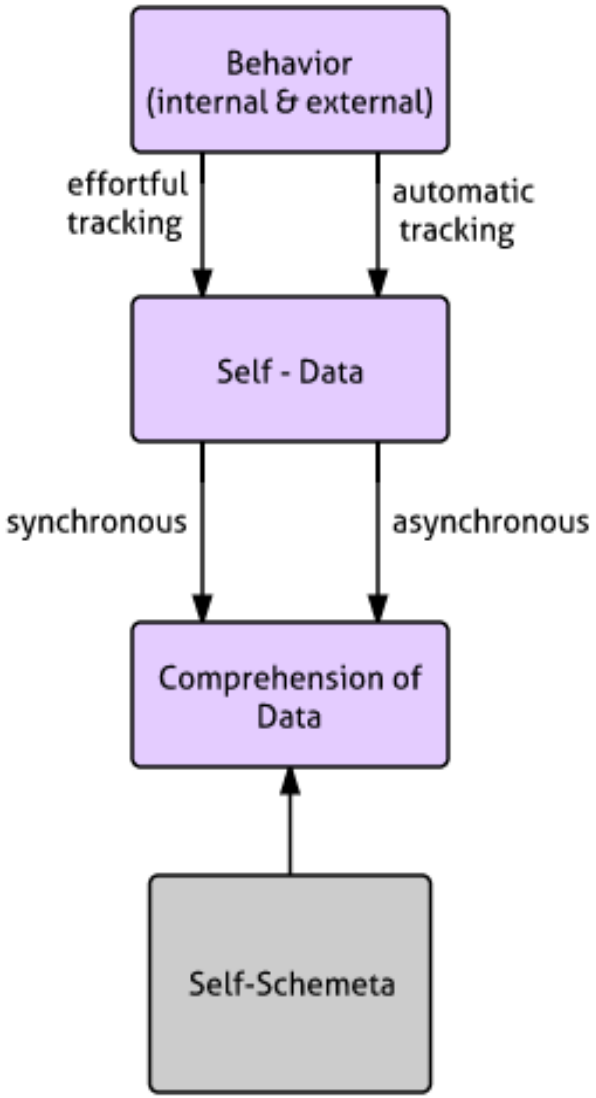
Quantified self

Shilton, K. (2012). Participatory Personal Data: An Emerging Research Challenge for the Information Sciences. Journal of the American Society for Information Science and Technology, 63(10).

Rivera-Pelayo, V., & Zacharias, V. (2012). Applying quantified self approaches to support reflective learning. Proceedings of the 2nd International Conference on Learning Analytics and Knowledge.

Li, I., Dey, A., & Forlizzi, J. (2011). Understanding my data, myself: supporting self-reflection with ubicomp technologies. Proceedings of the 13th International Conference on Ubiquitous Computing.

Dembosky, A. (2011). Invasion of the body hackers. Financial Times.



Is there a difference in (comprehension) between tracking that is effortful and tracking that is automatic ?

Is there a difference in (comprehension) between feedback that is presented synchronously vs. asynchronously?

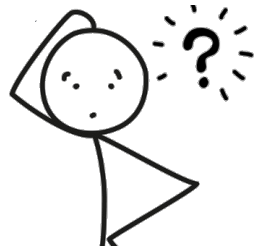
Can we recognize ourselves in our data? (data as mirror)
Can self-data shed light on aschematics?

Could self-data be used to validate existing measures of self-schemata?

Are there other uses for self-data? (not behavioral change) Reflective learning?

09.23.14

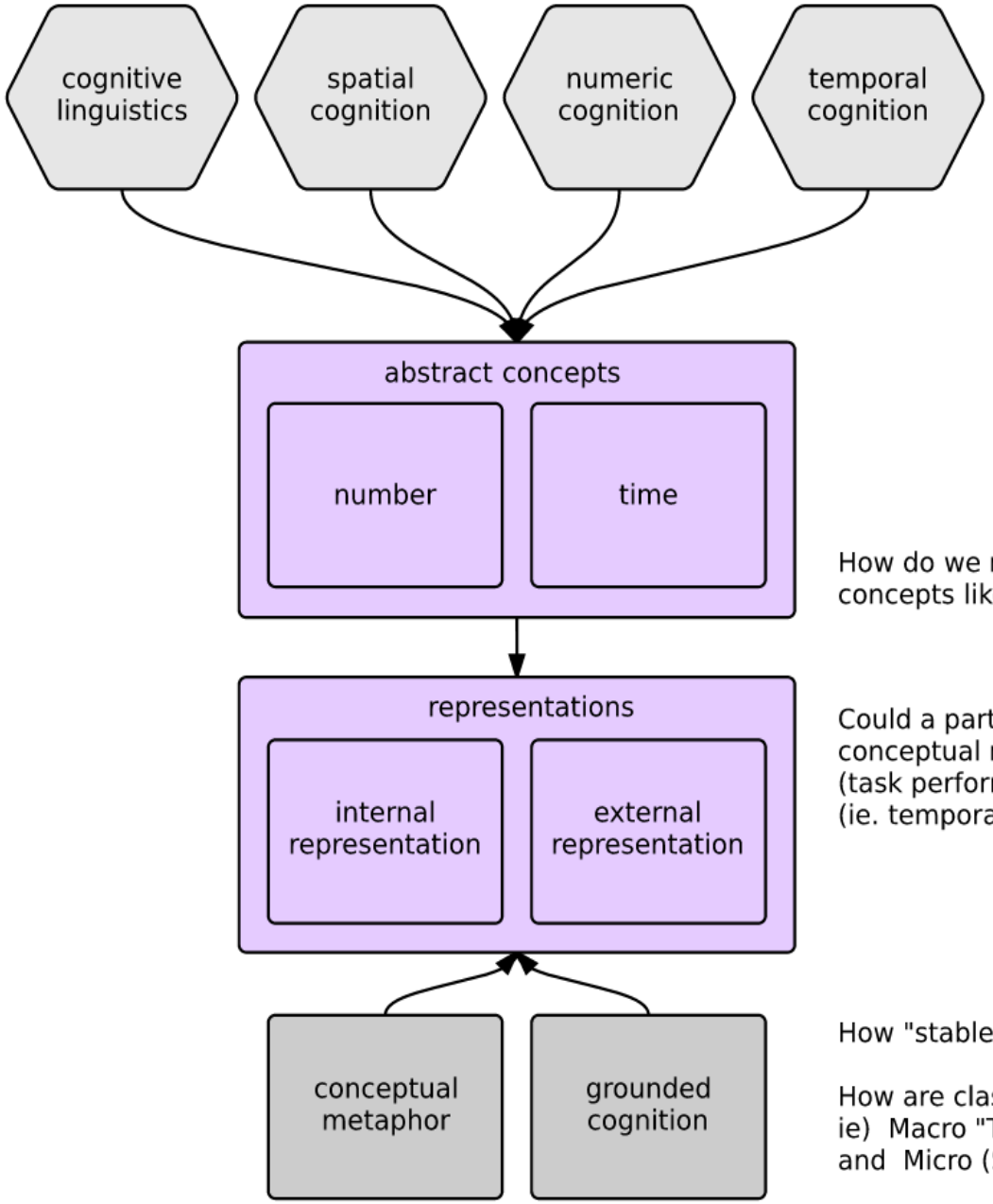
Conceptual metaphor



Lakoff, G., & Johnson, M. (2008). Metaphors we live by. University of Chicago press.

Núñez, R., & Cooperrider, K. (2013). The tangle of space and time in human cognition. Trends in Cognitive Sciences, 17(5), 220–9.

Casasanto, D. (2010). Space for thinking. In V. Evans & P. Chilton (Eds.), Language, cognition and space: The state of the art and new directions (pp. 453–478). Equinox.



How do we represent abstract concepts like "infinity" and "time" ?

Could a particular representation suggest a particular conceptual metaphor which in turn improve (task performance ? mood?) (ie. temporal perspective & mood, infinity & calculus)

How "stable" are conceptual metaphors ?

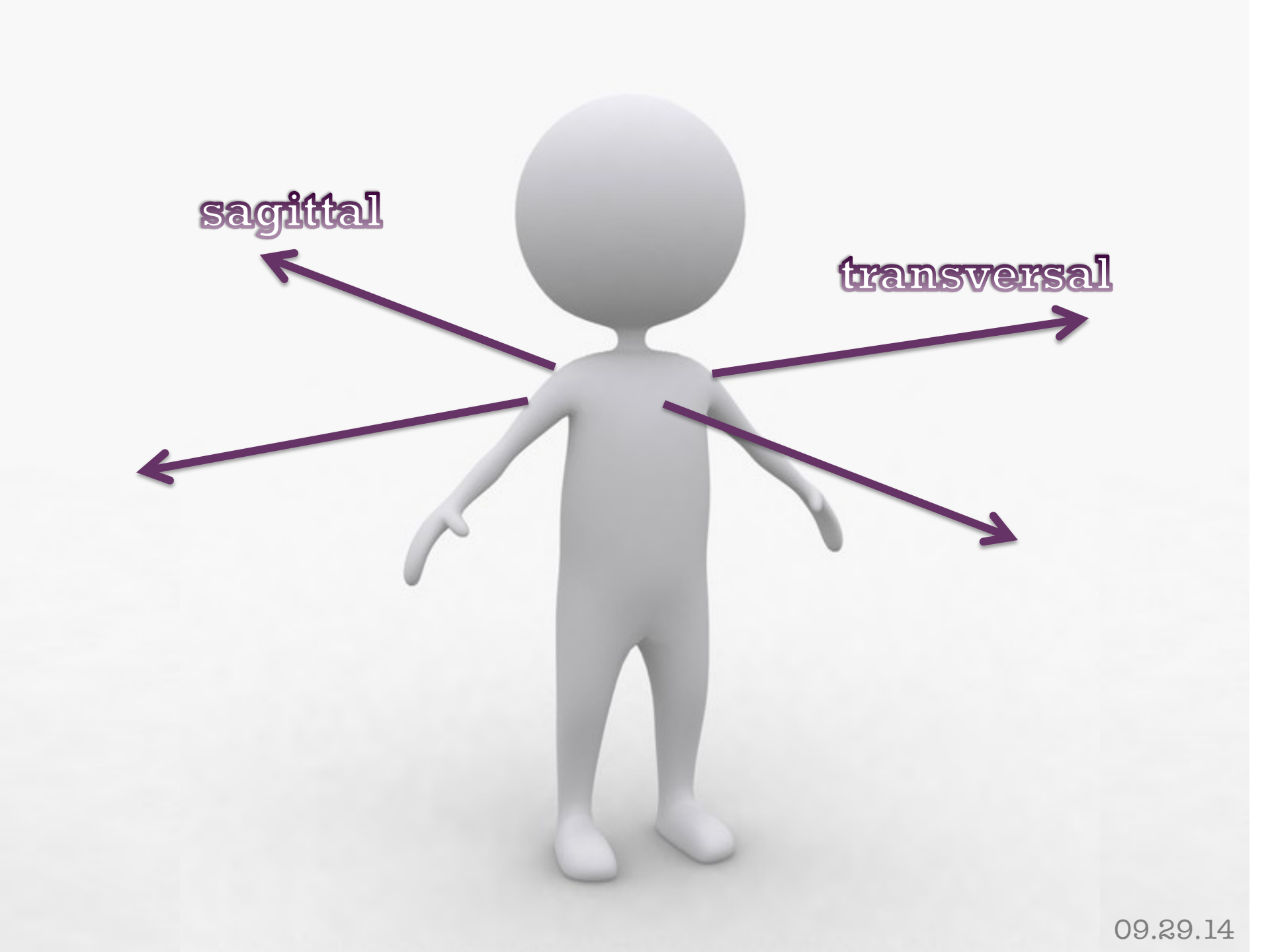
How are classes of metaphors organized for study? ie) Macro "Time is Space" vs. "Time is Quantity" and Micro (SCT) future is up, vs. future is right

09.23.14

Metaphor, space & time

Núñez, R., & Cooperrider, K. (2013). The tangle of space and time in human cognition. Trends in Cognitive Sciences, 17(5), 220–9.

Walker, E. J., Bergen, B. K., Núñez, R., Science, C., Bates, E., & Cohen, H. (2013). Investigating Spatial Axis Recruitment in Temporal Reckoning Through Acoustic Stimuli and Non-Spatial Responses of phonological processing. Center for Research in Language Technical Report, University of California, San Diego, 25(1), 1–10.


sagittal
transversal

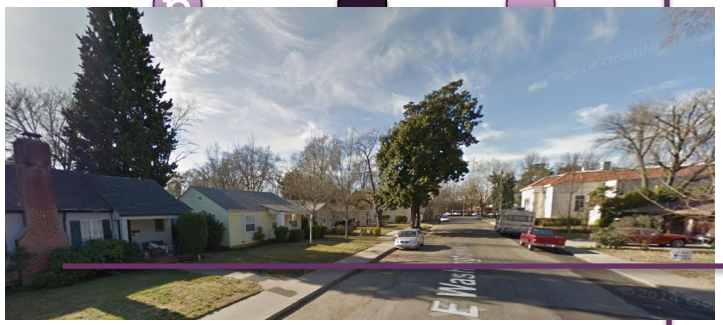
Wibbly wobbly time

A - time
deictic time

B - time
sequential time

internal
egocentric

past present future

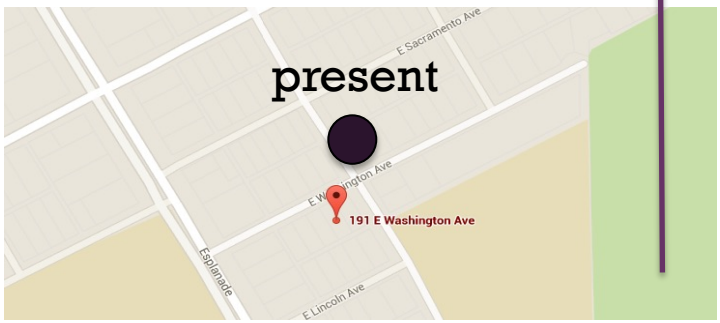


can this be represented?

external
allocentric

past future

earlier later



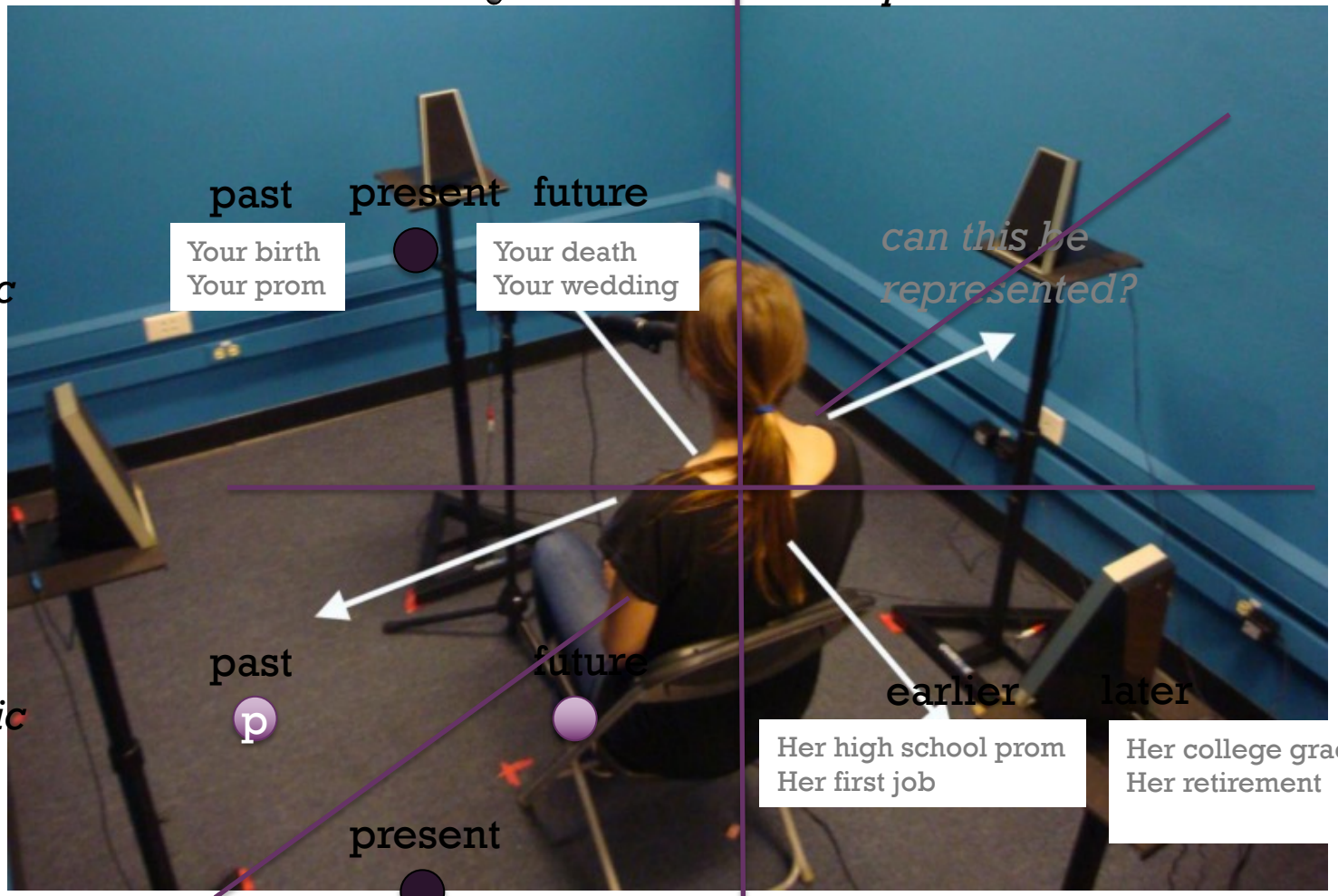
09.29.14

A - time
deictic time

B - time
sequential time

internal
egocentric

external
allocentric



→ (2) Linguistic stimulus X (2) presented spatially

→ Linguistic response – measured reaction time

(Walker et al., 2013)

09.29.14

Deictic Judgments

My birth is behind me,
my death is in front me

Sequential Judgments

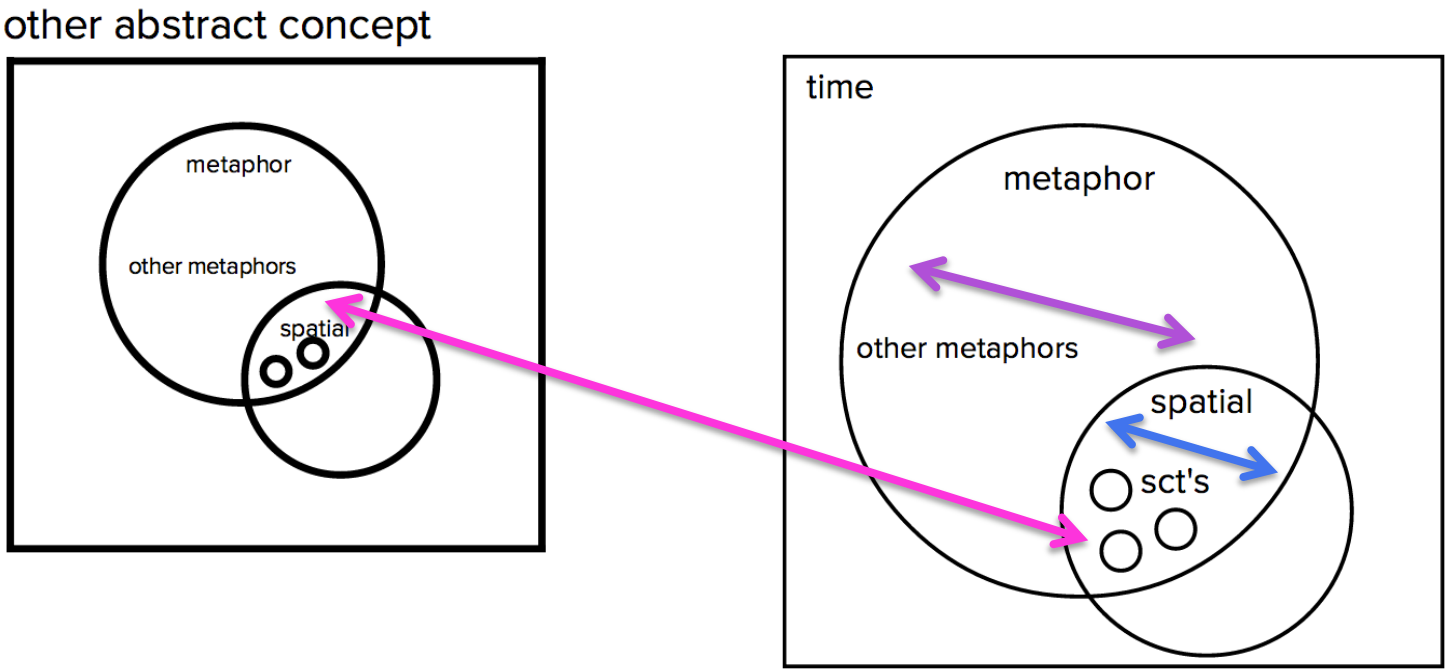
First job is in front,
retirement is behind

sagittal
fastest for
deictic judgments

Were the prompts successful in eliciting a sequential judgment?

When making sequential judgments, are we first performing a deictic judgment and then making a mental calculation?

(Walker et al., 2013)



spatial metaphors of different abstract concepts

spatial vs. non-spatial metaphors of the same abstract concept

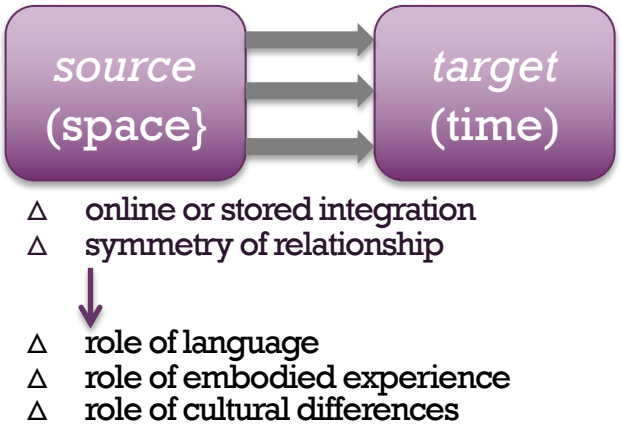
different spatial construals of the same abstract concept

09.29.14

HOW DO WE ASSIGN MEANING TO ABSTRACT CONCEPTS?

Theories of Metaphor

Conceptual Metaphor *(Lakoff & Johnson, 1980)*
Metaphoric Structuring *(Boroditsky, 2000)*
Integrated Metaphoric Structuring *(Casasanto, 2008)*
Structural Similarity *(Murphy, 1996)*



Spatial Metaphors for Time

Temporal Order

- Children; cross-cultural difference — *Tversky, B. Kugelmass, S. & Winter, A. (1991).*
- Nonlinguistic task; cross cultural difference — *Fuhrman, O., & Boroditsky, L. (2010).*
- Cross-Modality — *Walker, E. J.& Núñez, R. (2013)*
- Task demands; perspective taking — *Torralbo, A., Santiago, J., & Lupiáñez, J. (2006).*
- Asymmetry of space/time — *Cassasanto,2008*

Movement

- Asymmetry of space/time primes — *Boroditsky, L. (2000)*

time is space

Temporal Succession

Movement

time is moving	I am moving

Temporal Order

Earlier is…
Past is …

left	right
behind	in front
above	below

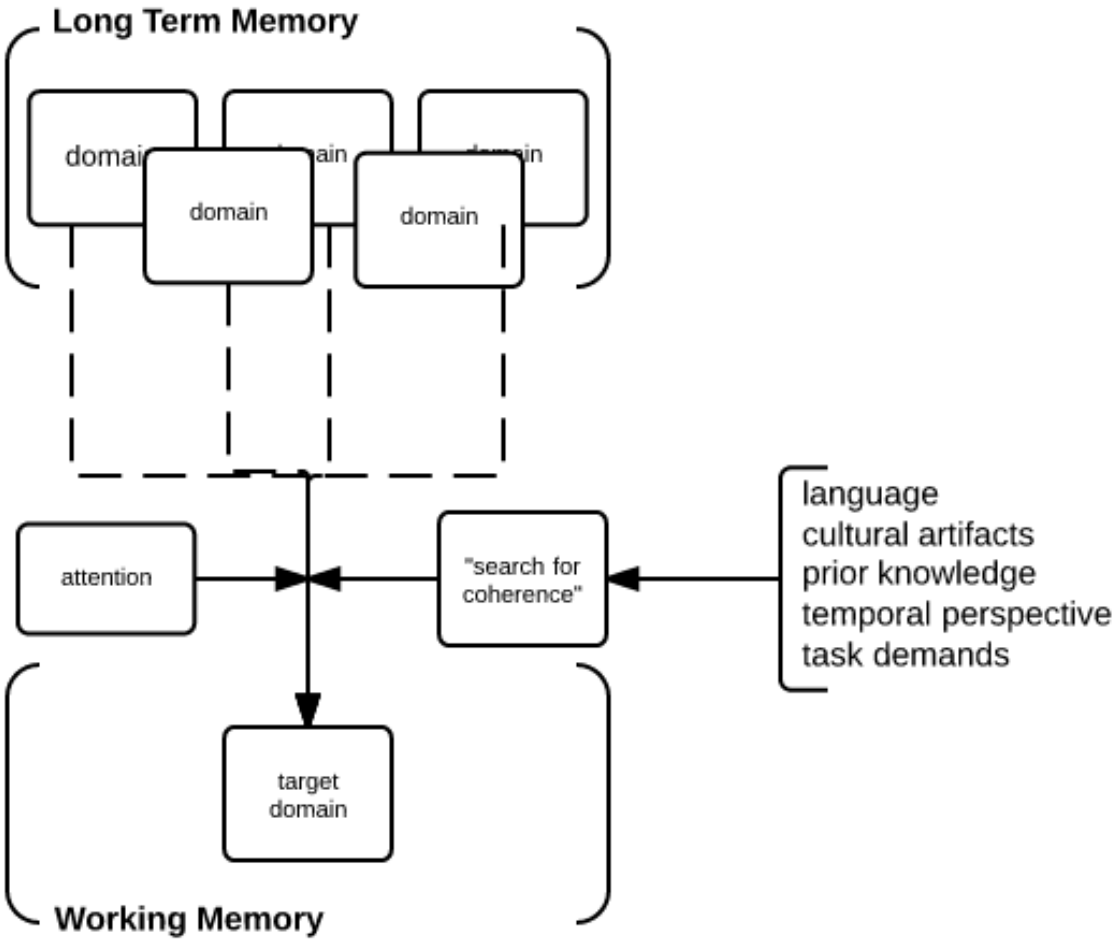
time is substance

Temporal Duration

time is [a limited resource with quantity]

Language
Cultural artifacts
Prior knowledge
Task demands
Temporal Perspective

HOW CAN WE EXPLAIN VARIABILITY IN USE OF METAPHORS?

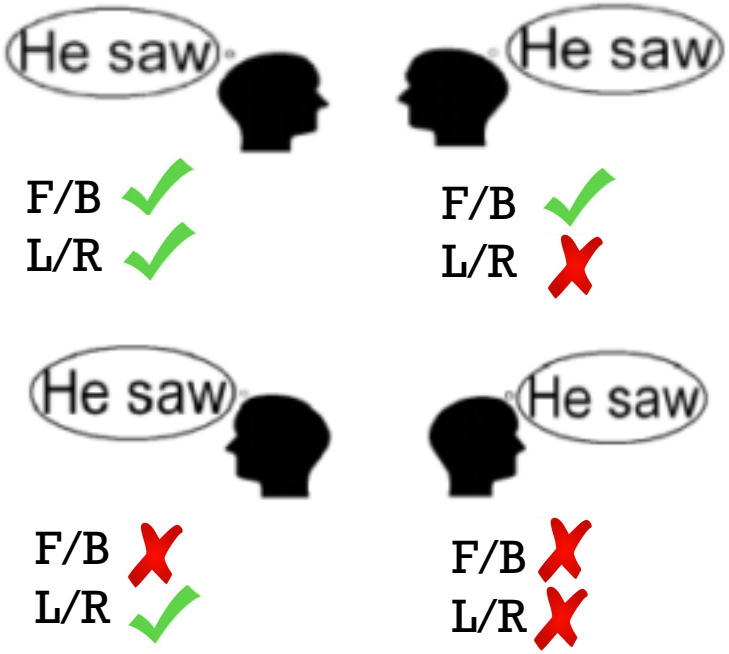


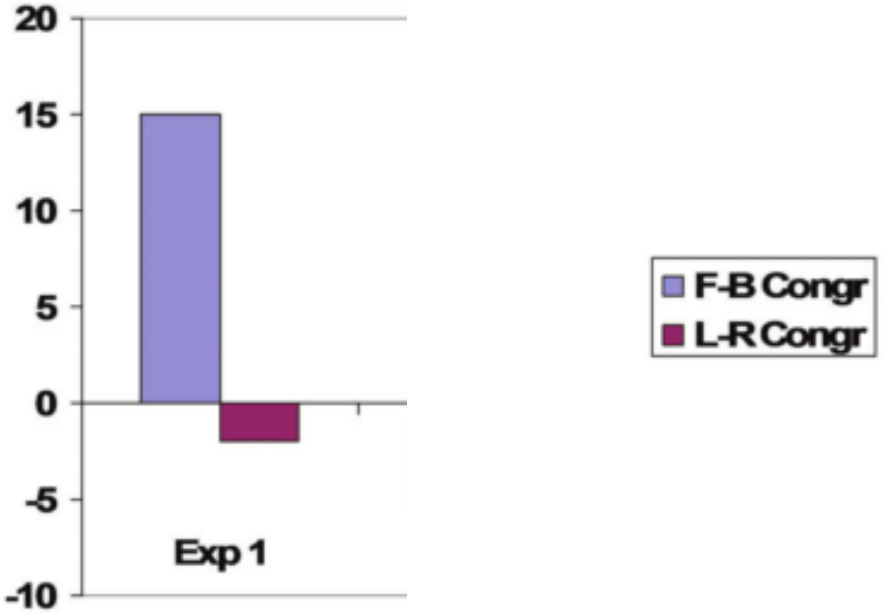
Torralbo, A., Santiago, J., & Lupiáñez, J. (2006). Flexible conceptual projection of time onto spatial frames of reference. Cognitive Science, 30(4), 745–57.

Santiago, J., Román, A., & Ouellet, M. (2011). Flexible foundations of abstract thought: A review and a theory. In T. W. Schubert & A. Maass (Eds.), Applications of Cognitive Linguistics: Spatial dimensions of social thought. Berlin, Germany. Walter de Gruyter.

Flexible conceptual projection of time onto spatial frames of reference

Is the person thinking about the future or the past?

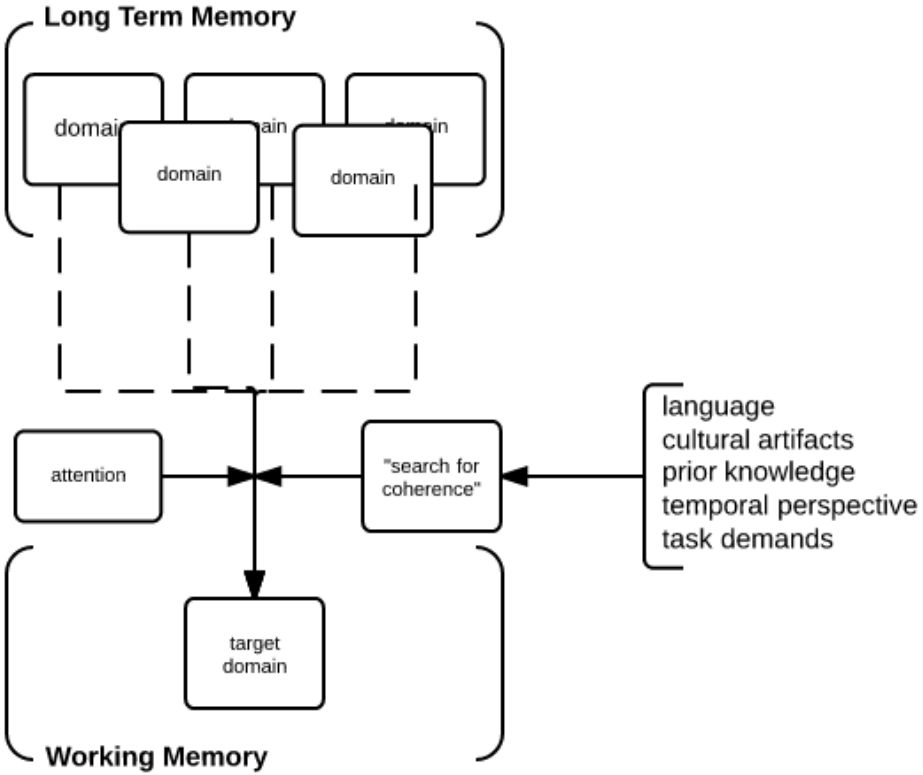




Comparison of left-right congruency effects on response latency

Experiment 1: Respond vocally (past, future)

Experiment 2: Respond with left/right key press (past, future)



Scope of flexibility

- Within – subjects
- Between – subjects

Representations

- Single
- Multiple

- Different
- Inconsistent
- Contradictory

- Internal
- External

	time is moving	I am moving	time is money
Earlier is…	left	right	
Past is …	behind	in front	
	above	below	

Metaphor, space & time

Lakoff, G., & Johnson, M. (1980). Conceptual Metaphor in Everyday Language. The Journal of Philosophy, 77(8), 453–486.

Murphy, G. (1996). On metaphoric representation. Cognition, (60), 173–204.

Boroditsky, L. (2000). Metaphoric structuring: understanding time through spatial metaphors. Cognition, 75(1), 1–28.

Casasanto, D., & Boroditsky, L. (2008). Time in the mind: using space to think about time. Cognition, 106(2), 579–93. doi:10.1016/j.cognition.2007.03.004

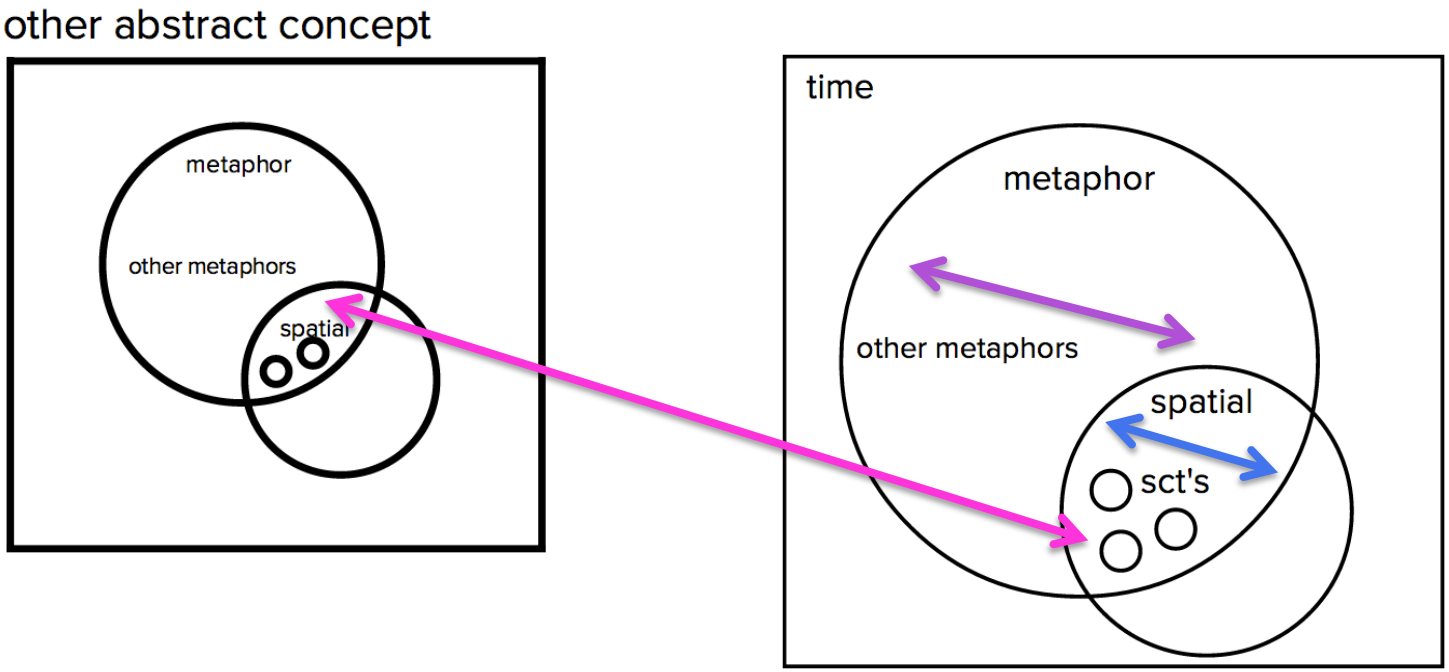
Fuhrman, O., & Boroditsky, L. (2010). Cross-cultural differences in mental representations of time: evidence from an implicit nonlinguistic task. Cognitive Science, 34(8), 1430–51

Torralbo, A., Santiago, J., & Lupiáñez, J. (2006). Flexible conceptual projection of time onto spatial frames of reference. Cognitive Science, 30(4), 745–57

Walker, E. J., Bergen, B. K., Núñez, R., Science, C., Bates, E., & Cohen, H. (2013). Investigating Spatial Axis Recruitment in Temporal Reckoning Through Acoustic Stimuli and Non-Spatial Responses of phonological processing. Center for Research in Language Technical Report, University of California, San Diego, 25(1), 1–10.

Santiago, J., Román, A., & Ouellet, M. (2011). Flexible foundations of abstract thought: A review and a theory. In T. W. Schubert & A. Maass (Eds.), Applications of Cognitive Linguistics: Spatial dimensions of social thought. Berlin, Germany. Walter de Gruyter.

What questions might I ask?



spatial metaphors of different abstract concepts

spatial vs. non-spatial metaphors of the time

different spatial [representations] of time

frames of reference

EMG (ego/internal)
DMG (allo/external)
(Stocker, 2012)

mental gaze

sequential
deictic
(McTaggart, 1908)

relation type

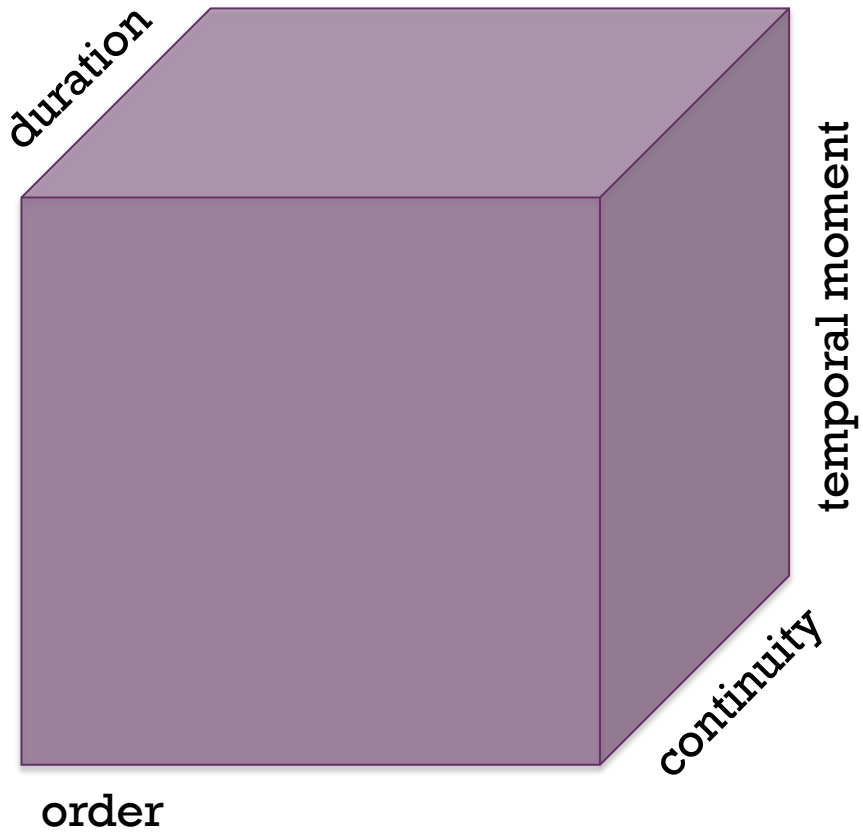
right/left;
back/front;
up/down
(Tversky, 1991)

relative location

ego-moving
time-moving
(Boroditsky, 2000)

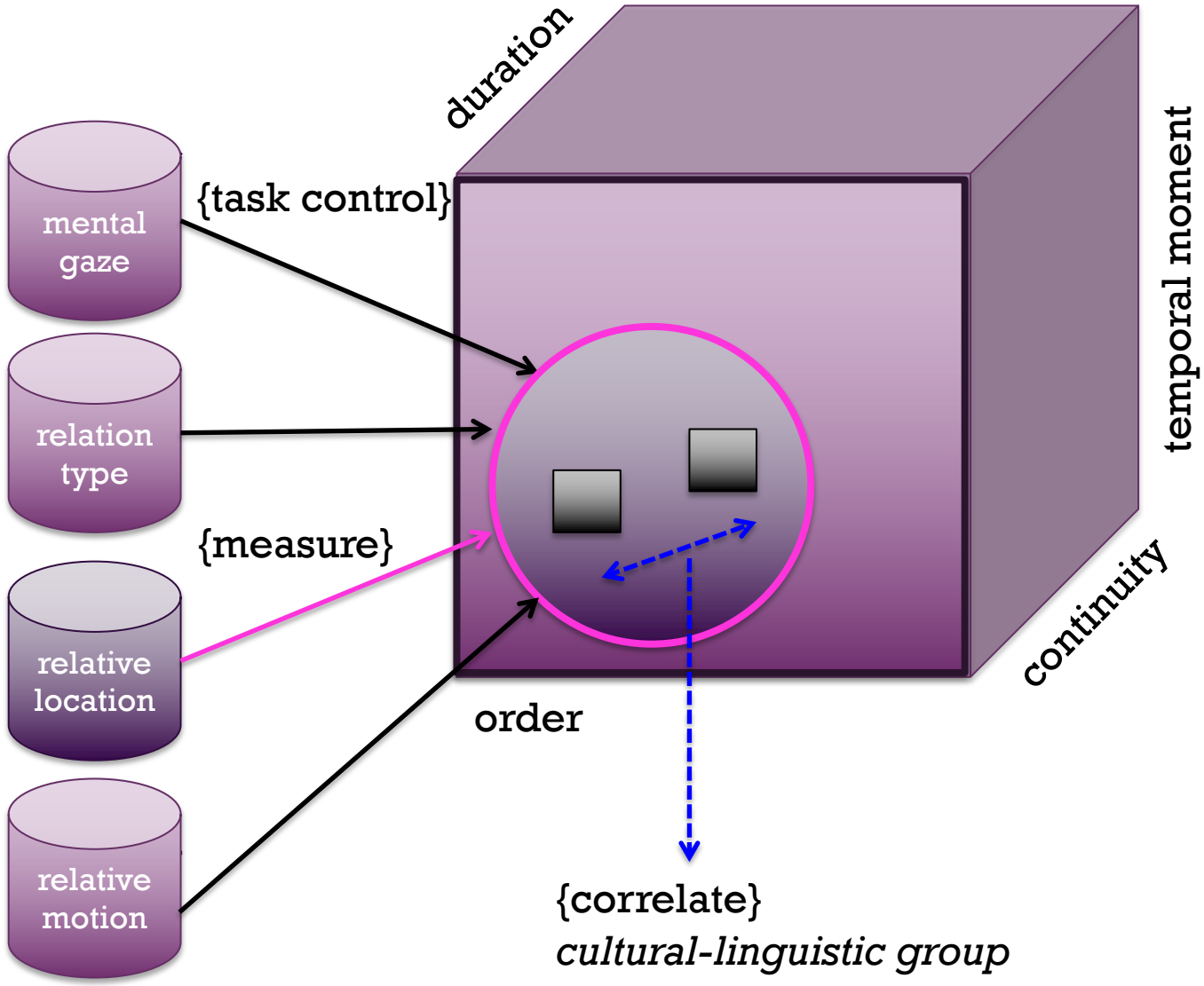
relative motion

aspects of temporal experience



frames of reference

aspects of temporal experience



EMG (ego/internal)
DMG (allo/external)
(Stocker, 2012)

sequential
deictic
(McTaggart, 1908)

right/left;
back/front;
up/down
(Tversky, 1991)

ego-moving
time-moving
(Boroditsky, 2000)

WHAT IS FLEXIBILITY? DOES IT EXIST?

We are capable of thinking about abstract concepts

We often think about abstract concepts in terms of concrete concepts

metaphor

For a particular abstract concept, we may recruit multiple metaphors

time is space

time is substance

Evidence suggests flexibility within - subjects

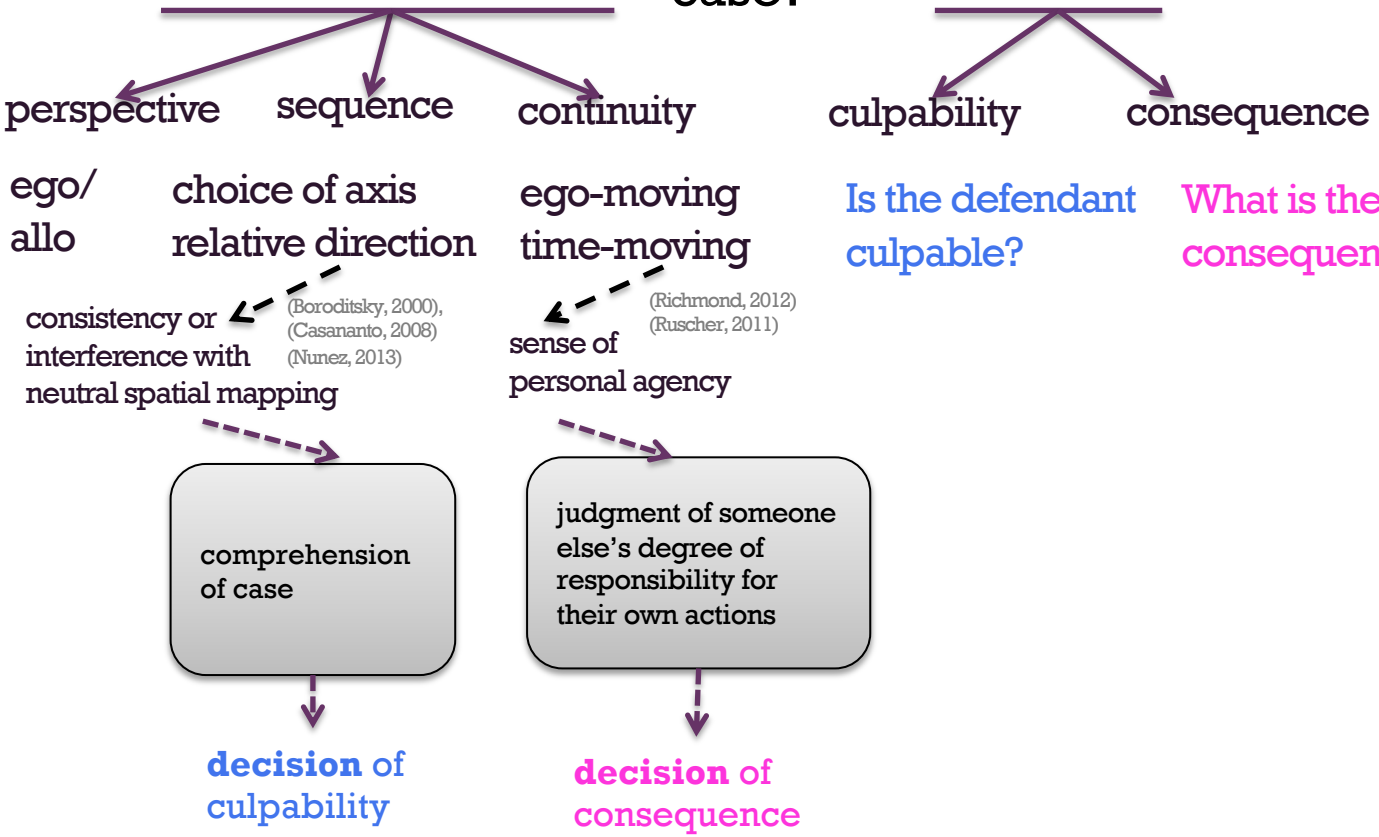
Priming & congruency effects	(McGlone & Harding, 1998) (Boroditsky, 2000) (Boroditsky & Ramscar, 2002) (Gentner, Imai and Boroditsky, 2002) (Santiago, Lupianez, Perez & Funes, 2007) *	time is moving	I am moving
		earlier is left	earlier is behind

Evidence suggests flexibility between - subjects

Linguistic analysis, gestural observation, content analysis	(Tversky et. al., 1991) (Nunez & Sweetser, 2006) (Casasanto, 2008)	past is behind (english)	past is infront (arabic)
		earlier is left (english)	earlier is right (arabic)

There exists a high degree of variability in the metaphors we use to think about time

Can the visualization of time influence the outcome of a legal case?

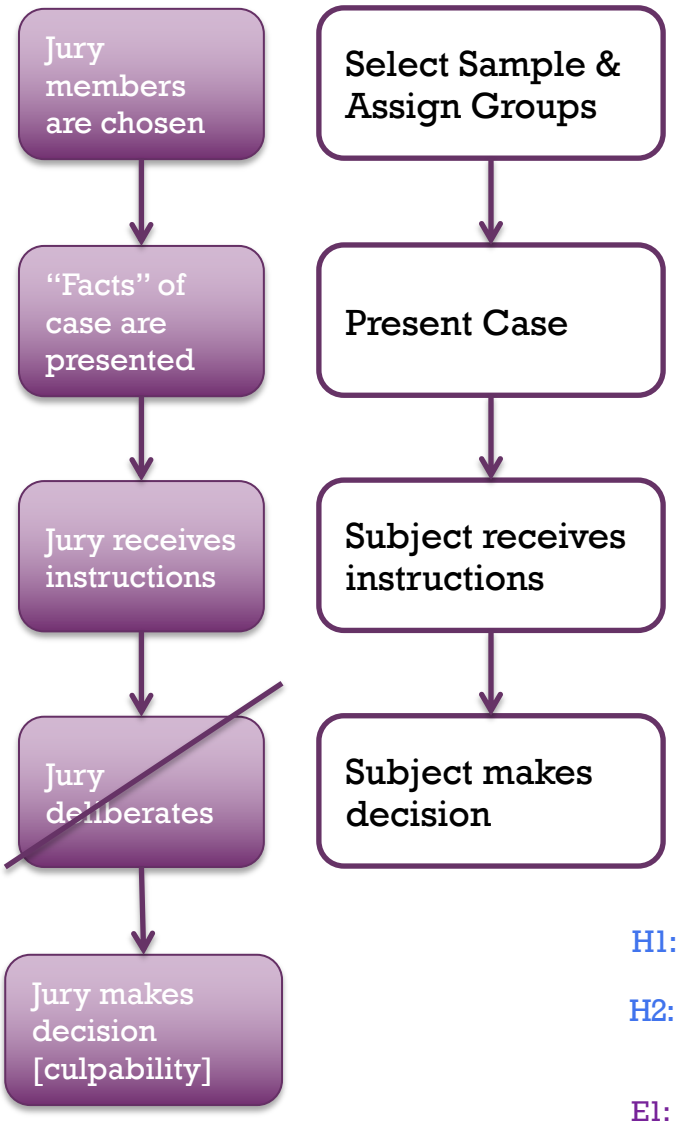


Inconsistent and contradictory representations of the sequence of events will result in confusion. This confusion will impair the development of a mental model for the sequence of events. Ss will have less confidence in their decision and be less likely to find the defendant culpable.

Ego-moving representations will cause the Ss to assign a greater sense of perceived personal agency on the part of the defendant, resulting in the assignment of a more severe consequence, on the basis that the defendant had a high level of control over their actions. This effect will be greatest for Ss who have strong personal agency themselves.
(Inverse for time-moving)

10.28.14

Task 2: Effect of direction metaphor on [comprehension / doubt ?]



Ordering Task: Measure SCT(1)
Assign groups based on SCT

Group A (inconsistent) | Group B (contradictory) | Group C (no viz) | Group D (consistent)

Ss receives instruction on relevant case law

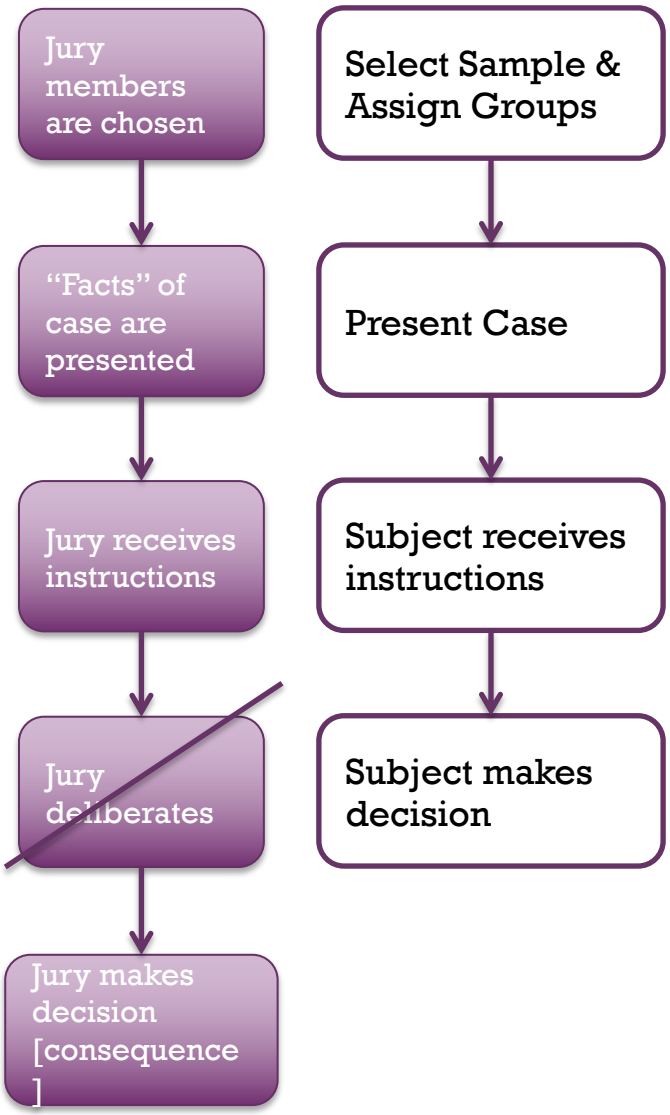
Decision Task: decide culpability
Recall Task (1) : recall of event details
Recall Task (2) : recall of event sequence
[choose representation axis & direction (SCT2)]

H1: low recall — lowest recall —— best recall

H2: less culpability — lowest culpability —— highest culpability
less confident — lowest confidence —— highest confidence

E1: —————— SCT(1) == SCT(2) ——————

Task 1: Effect of movement metaphor on severity of consequence



Measure AGENCY (a1) via BIF
Measure ME/MT (m1) via ambiguous questions
Assign groups, matching for ME/MT

Group A (M-E) | Group B (M-T) | Group C (None)

Informed of culpability decision and relevant case law

Decision Task: given range of $$ compensation, Ss choose value
Measure ME/MT(m2) via ambiguous questions
Measure TEMPORAL PERSPECTIVE (TP) via scale

H1: Highest $$ Lowest $ Normal Dist. $$

H2: $(low agency) $$$ (high agency)
[within each group & across all Ss]

E1: m2 = M-E m2 = M-T m2 = m1

10.28.14

Can the visualization of time influence the outcome of a legal case?

ego/
allo

choice of axis
relative direction

ego-moving
time-moving

Is the defendant culpable?

What is the appropriate consequence?

When compared with a neutral © control group

H1: inconsistent (A) and contradictory (B) representations of sequence will result in less accurate recall of case

H2: inconsistent (A) and contradictory (B) representations of sequence will result in a lower probability of culpable findings

H0: no significant differences in decision of culpability or recall of case will be found

E1: After a brief delay, Ss choice of spatial mapping (SCT) will return to neutral condition.

When compared with a neutral © control group

H1: ego-moving(D) representations will result in more severe consequences than time-moving (E) representations.

H2: <predict (interaction?) with extremes of high/low perceived personal agency>

H0: no significant differences in decision of severity of consequences will be found

E1: After a brief delay, Ss choice of movement mapping (M-M) will not return to neutral condition.

Can the visualization of time influence the outcome of a legal case?

perspective | sequence | continuity | culpability | consequence

ego/ allo | choice of axis relative direction | ego-moving time-moving | Is the defendant culpable?

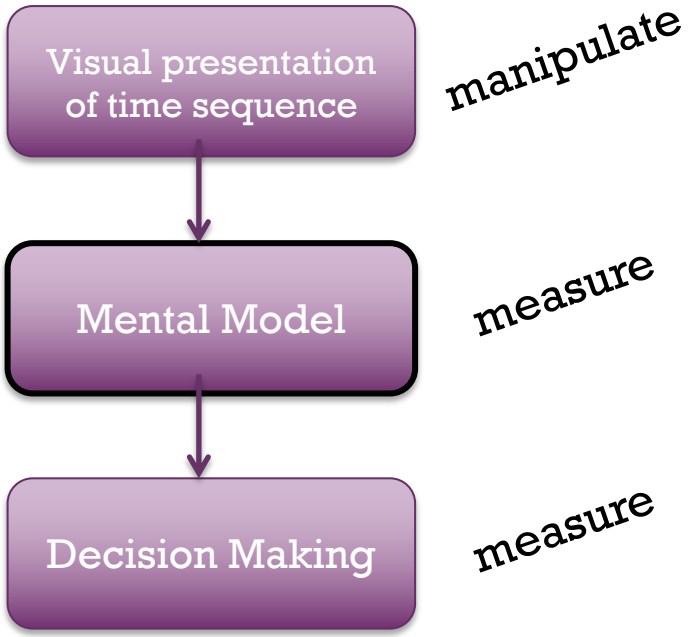
When compared with a neutral © control group

H1: inconsistent (A) and contradictory (B) representations of sequence will result in less accurate recall of case

H2: inconsistent (A) and contradictory (B) representations of sequence will result in a lower probability of culpable findings

H0: no significant differences in decision of culpability or recall of case will be found

E1: After a brief delay, Ss choice of spatial mapping (SCT) will return to neutral condition.



*Goal: learn something about **flexibility** of spatial metaphors*

1 sided argument

(inconsistent) (contradictory) (consistent)

2 factor (initial SCT X presentation SCT)
16 possible conditions
2 x 4 = 8 conditions + no graphic (control)

1. Measure SCT
2. Present stimuli
3. Present evidence
4. Measure Memory
5. Measure Comprehension
6. Measure Decision

IV: SCT0
IV: stimulus SCT1
DV: culpability decision
confidence
memory of seq
comprehension of seq
reconstruction SCT

presentation SCT	initial SCT: LR	initial SCT: RL	initial SCT: TB	initial SCT: BT
vertical / BT	inconsistent	inconsistent	contradictory	consistent
vertical / TB	inconsistent	inconsistent	consistent	contradictory
horizontal / RL	contradictory	consistent	inconsistent	inconsistent
horizontal / LR	consistent	contradictory	inconsistent	inconsistent

initial SCT: horizontal (LR, RL); vertical (TB, BT)

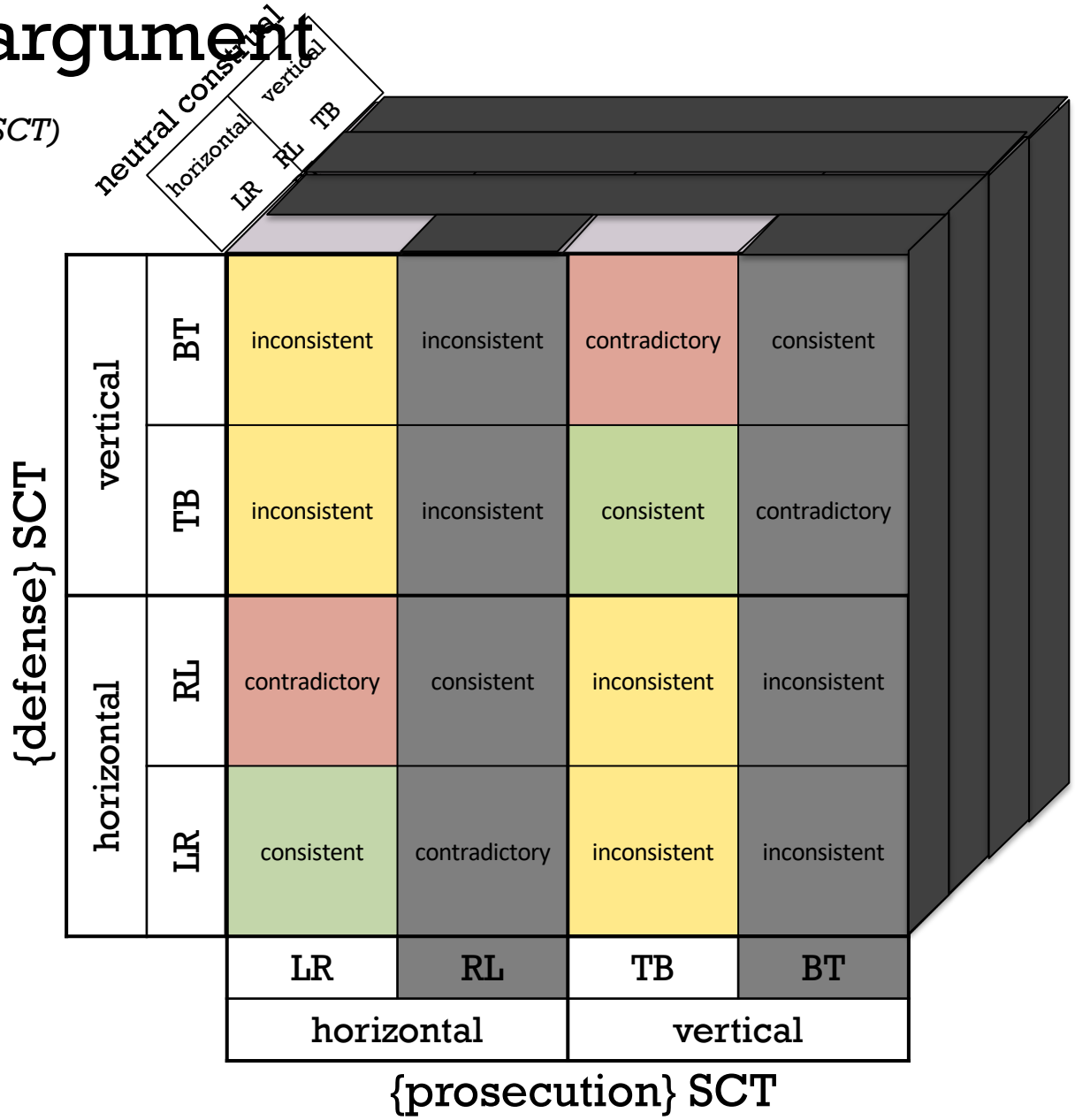
12.09.14

2-sided argument

3 factor (initial SCT x 1st SCT x 2nd SCT)
64 possible conditions
reduce to 8 by …
SCT0 = LR ; SCT1 = [LR || TB]

1. Measure SCT
2. Present 1st stimuli
3. Present 2nd stimuli
4. Present evidence
5. Measure Memory
6. Measure Comprehension
7. Measure Decision

IV: SCT0
IV: stimulus SCT1
IV: stimulus SCT2
DV: culpability decision
confidence
memory of seq
comprehension of seq
reconstruction SCT



CONCEPTUAL FRAMEWORK

- Time is an abstract concept, for which we have (thus far) found no dedicated sensory organ (Block, 1990; Hancock & Block, 2012).
- In language, we employ a number of metaphors to express ideas about time (Lakoff & Johnson, 1980). [conceptual metaphor]
- Abstract domains (such as time) are structured through metaphorical mappings from domains grounded directly in physical experience (such as space)(Boroditsky, 2000). [grounded cognition; metaphor]
- Empirical evidence suggests that individuals automatically recruit "culturally suggested" representations of time, even when performing non-linguistic tasks (card sort, early/later judgments of pictures) (Fuhrman & Boroditsky, 2010).
- Culturally suggested spatial representations of time are the product of: linguistic metaphors, writing direction, and cultural artifacts (Núñez & Cooperrider, 2013).

Time is tricky → so we use metaphors → these go deeper than language

CONCEPTUAL FRAMEWORK

- Temporal metaphors show an impressive degree of flexibility within and across individuals, languages and cultures (Santiago et al., 2011).
- There is a dearth of linguistic metaphors for directionality of time; however, there are metaphors in cultural artifacts, including reading direction, calendars, and the typical layout of graphs (Santiago et al., 2011).
- During information processing, humans create small-scale models of the world, consisting of mental images and complex abstract structures (Johnson-Laird, 1999). [(modern) mental model theory of reasoning]
- "Inconsistent metaphoric mappings for a given domain may coexist in semantic memory and be activated in different situations and by different reasons, but not at the same time, as this would lead to the generation of internally inconsistent mental models." (Santiago et al., 2006) [flexible foundations theory of metaphoric reasoning]
- Temporal sequence – the order of events – is the most basic requirement for causation (Johnson-Laird, 1999). //and I'm sure philosophers have been saying this for centuries – note to self – read on philosophy of causation

How flexible is our capacity for metaphoric thinking?

spatial construal of time [SCT]

temporal order

What factors influence our selection of a particular metaphorical representation for a particular task?

visual-spatial presentations of stimuli

How does the interaction of different metaphorical representations affect comprehension, reasoning and decision-making?

causation in litigation law

01.20.15

Can the visualization of sequence influence causal judgments in a legal case?

The presentation of **inconsistent** or **contradictory** timelines impairs the development of a coherent mental model for a sequence of events. As a consequence, Ss will have decreased memory for the details and order of presented events, and therefore be more likely to make errors in determining causation. In a mock-trial scenario, Ss will have less confidence in their decision of culpability.

When compared with a control group (consistent timeline), Ss presented with inconsistent (A) and contradictory (B) timelines will...

H1: remember fewer details of the case
H2: remember the case less accurately
H3: be less likely to decide the defendant is culpable
H4: have less confidence in their decision
E1: After a brief delay, Ss choice of spatial construal (SCT) will return to neutral condition.

*Goal: learn something about **flexibility** of spatial metaphors*

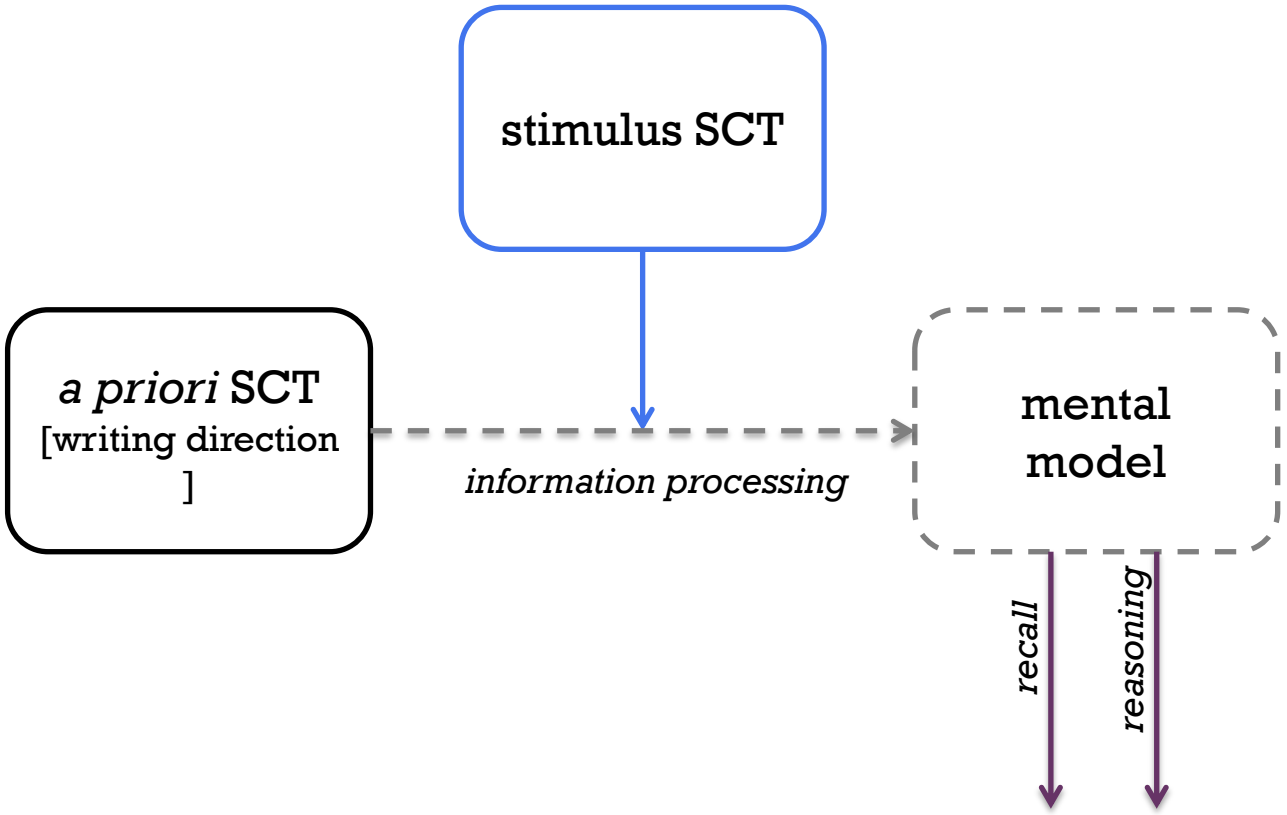
01.20.15

Procedure

1. Measure SCT_p via [timeline construction task]. Ss who do not select an SCT_p = 1 Horizontal (L → R) will be excluded from analysis.
2. Present stimuli: audio/video recording of description of events alongside a powerpoint presentation of a timeline. Ss are wearing headphones, unable to pause, rewind or fast forward.
3. Filler task: audio/video presentation of photographic evidence (adds additional load to memory, not relevant to causation)
4. Recall & Recognition Task: Ss recall, then recognize details from the case
5. Reconstruction Task: Ss reconstruct the sequence of events
6. Decision Task: Ss make culpability decision and rate their confidence.

STUDY 1: ONE INFORMATION SOURCE

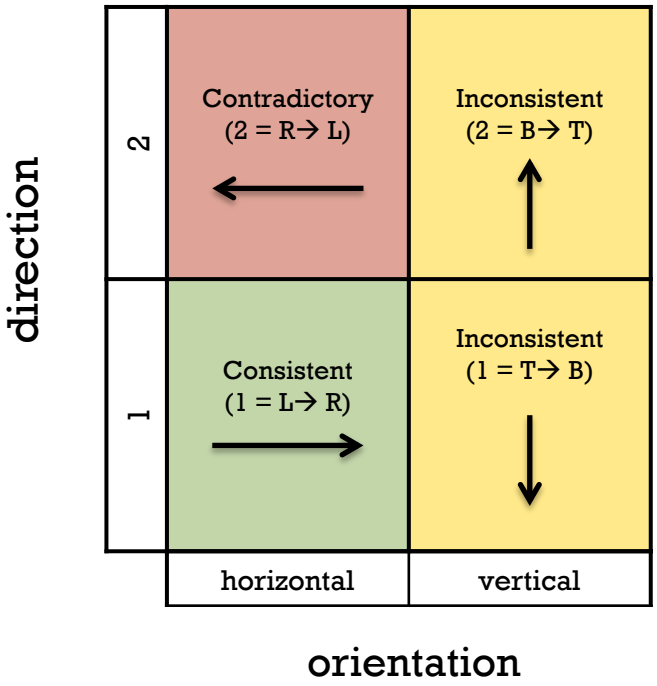
current



STUDY 1: ONE INFORMATION SOURCE

current

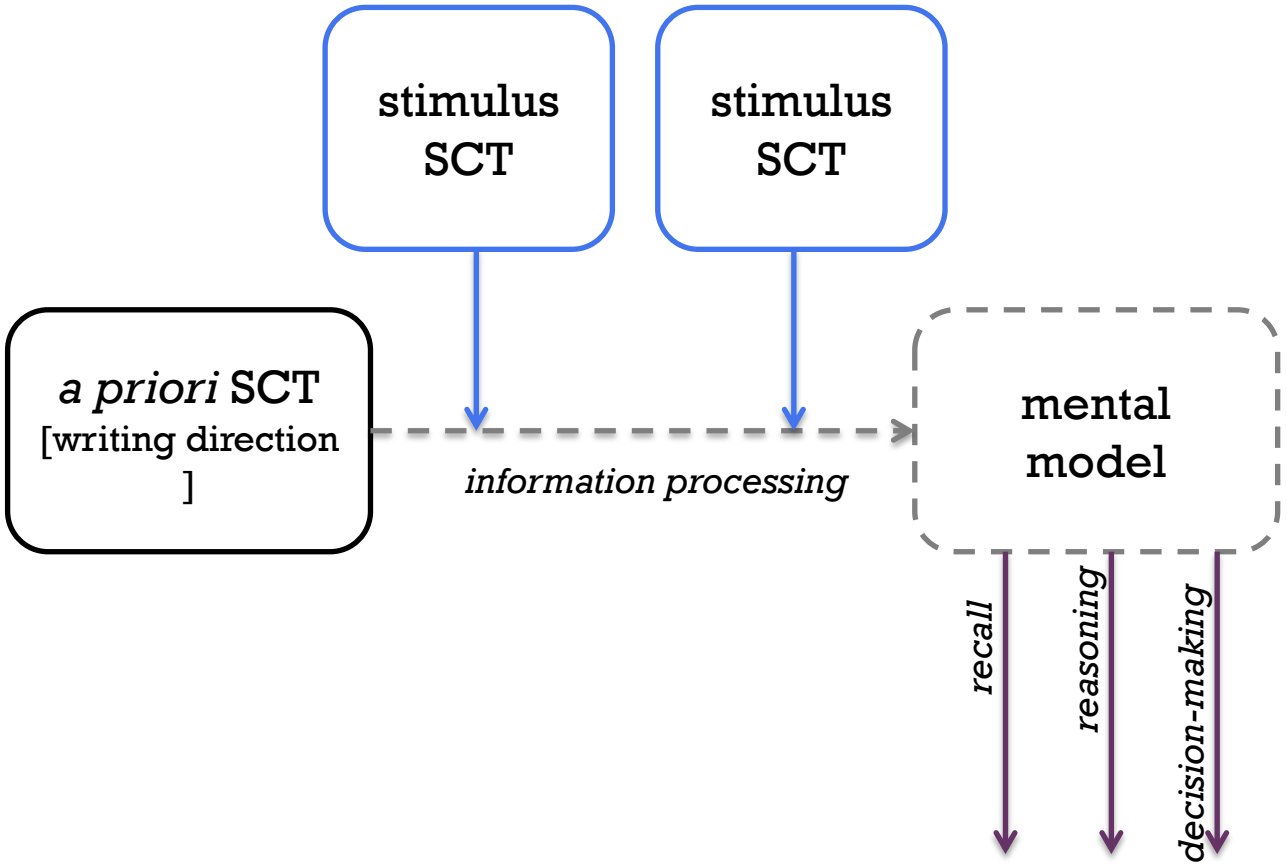
2 (orientation: horizontal vs. vertical) X 2 (direction: same as writing vs. opposite to writing) design, yielding four experimental conditions



CV: *a priori* SCT
IV: presentation SCT
DV: memory (recall + recognition)
reasoning
reconstruction SCT

STUDY 2: TWO-SIDED ARGUMENT

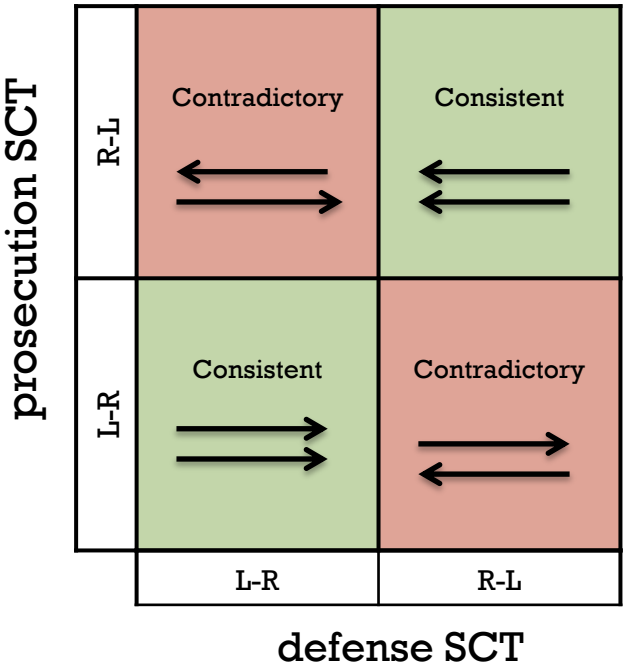
current



STUDY 2: TWO-SIDED ARGUMENT

current

2 (prosecution SCT: L->R vs. R->L) X 2 (defense SCT: L->R vs. R->L) yielding four conditions



CV: *a priori* SCT
IV: prosecution SCT
defense SCT
DV: memory (recall + recognition)
decision-making
confidence
reconstruction SCT

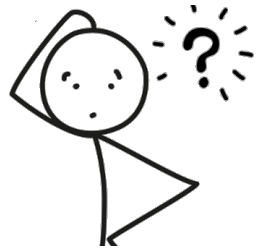
STATUS SUMMARY

Master's Thesis

Amy Rae Fox

2014-2015

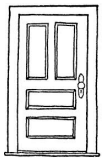
9.16.14 Status



activities

- Reading for breadth in ~ 10 topics

progress



- Narrowed focus to 5 potential areas
- Explored applications & recent research in each area

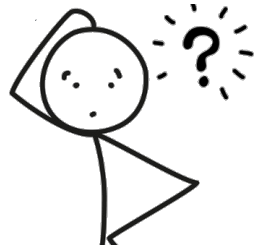
obstacles

- Difficulty deciding

plans

- Narrow focus to 1-2 topics
- Find research on self-schemata
- Generate list of potential research questions

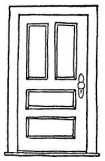
9.23.14 Status



activities

- Articles, book chapters in Self-Schemata
- Searching and reading in Conceptual Metaphor

progress



- Narrowed focus to 2 of 5 potential areas
- Generated potential research questions

obstacles

- Difficulty deciding
- Aversion to measures of dimensions of self

plans

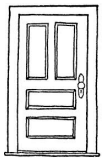
- Reading in Conceptual Metaphor (time, infinity)
- Search & read recent research on self-schemata
- Expand my list of research questions via this reading
- Narrow to one of the two presented options
- Prioritize research questions in that area

9.29.14 Status

activities

Browsed articles in Self-Schemata
Gathered and read in mental representations of time

progress



Narrowed focus to 1 research area! WOOHOO!
Generated potential research questions
Found a study I love! WOOHOO!

obstacles

Feeling overwhelmed by literature
Time is trixsy

plans

Further develop my conceptual model of:

- "types" of time
- spatial construals of time

Develop matrix of previous work by

- *type* of time, spatial construal, linguistic/cultural group, task modality, measurement modality

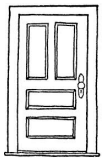
Read about conceptual metaphor vs. career of metaphor vs. structural similarity hypotheses
Think about on which construct I want to focus

10.21.14 Status

activities

Read empirical articles on spatial representations of time
Read in metaphor

progress



Expanded conceptual model of time / space / metaphor
Fixed on *flexibility in metaphor* as phenomenon of interest
Found theory seeking to explain the phenomenon
Identified several relevant factors
Developed a back-up plan

obstacles

Time ☺
Expertise in this subject area

plans

Consolidate open questions from 3 key papers
Select single question for current investigation

10.28.14 Status

activities	Read in individual differences of movement metaphors
progress	Consolidated conceptual model of time / space / metaphor Developed specific research question Developed hypotheses Developed potential experimental designs
obstacles	Time ☺ Knowledge of law & legal psychology
plans	Consider importance of ego/allo-centric perspective Reconsider *agency* (action identification theory) Investigate attribution theory Brainstorm case scenarios Develop operational definitions

12.09.14 Status

done

- Topic
- Conceptual framework & research community
- Research question
- Hypothesis
- 3 experimental designs:
- 1 sided argument
- 2 sided argument
- movement metaphor/personal agency

Need to do

- Finalize experimental design
- Develop (& pilot?) dependent measures
- Develop scenarios
- Build visualizations
- Pick a title
- Additional Reading:
- Validate constraints of visualization methods in the courtroom
- Reading in legal viz

01.20.15 Status

reading	mental models & causation demonstrative evidence & multimedia
progress	Contact with litigation graphics consultancy Located mock trial materials & began constructing materials
obstacles	
plans	Decide on S1 v. S2 with thesis chair Continue materials development Elaborate dependent measures